We claim as our invention:

1. A hydrogen gas generating system, comprising:

a membrane electrode assembly including an anode, a cathode and an ionically conductive membrane therebetween;

electrical connections for applying electrical power from a source of electrical power to said cathode and anode; and

a non-circulating fuel transport system for transferring a water/fuel mixture by capillary action to said anode to generate hydrogen gas.

2. The invention of claim 1, wherein said non-circulating fuel transport system further comprises:

a first portion in contact with the water/fuel mixture for transporting the water/fuel mixture to the anode and a second portion in contact with said first portion for collecting gases therefrom.

3. The invention of claim 2, wherein said first and second portions are interspersed.

4. The invention of claim 2, wherein said first and second portions are interlaced.

5. The inventions of claims 2 or 3, wherein

said first portion is hydrophilic; and

said second portion is hydrophobic.

6. The inventions of claims 2 or 3, wherein

said first portion has higher capillary forces than said second portion.

7. The inventions of claims 2 or 3, wherein

said first portion has a smaller effective pore size than said second portion.

8. The invention of claims 2 or 3 wherein the non-circulating fuel transport system further comprises:

a replaceable fuel water canister.

9. A hydrogen gas generating system, comprising:

a membrane electrode assembly including an anode, a cathode and an ionically conductive membrane therebetween;

a fuel transport system for transferring a water/fuel mixture to said anode; and

electrical connections for applying electrical power, from a source of electrical power generated by hydrogen gas, to said membrane electrode assembly to produce hydrogen gas,

wherein excess hydrogen gas is produced by said membrane electrode assembly beyond the hydrogen gas directly consumed by said source of electrical power to provide power to said membrane electrode assembly.

10. The invention of claim 9, further comprising:

a fuel cell.

11. The invention of claim 10, wherein the electrical connections further comprise:

a series electrical connection between the membrane electrode assembly and the fuel cell.

12. The invention of claims 1 or 9, further comprising:

a hydrogen gas storage tank associated with said anode for selectively storing the hydrogen gas provided by said membrane electrode assembly and for selectively releasing the hydrogen gas to the source of electrical power.

13. The inventions of claim 12, wherein a portion of the stored hydrogen gas is provided to the source of electrical power during startup operations of the source.

14. The inventions of claim 10, wherein the cumulative cell-amps of the H_2 generator are greater than the cumulative cell-amps of the fuel cell.

15. The inventions of claim 12, wherein the source of electrical power provides electrical power to a load in addition to said membrane electrode assembly, said invention further comprising:

a forward regulator for varying the amount of hydrogen gas provided by the membrane electrode assembly to the source of electrical power to enhance load following characteristics of the source for changes in the amount of electrical power required by the load.

16. The invention of claim 15, wherein the forward regulator opens to provide hydrogen gas to the source of electrical power during startup of the source.

17. The invention of claim 15, wherein said forward regulator opens to provide additional hydrogen gas to the source of electrical power when the operating efficiency of the source is reduced.

18. The invention of claim 15, wherein

the source of electrical power provides electrical power to a load in addition to said membrane electrode assembly; and

said forward regulator varies the amount of hydrogen gas provided by the membrane electrode assembly to the source of electrical power to enhance load following characteristics of the source for changes in the amount of electrical power required by the load.

19. The inventions of claim 15, further comprising:

electrical connections for applying electrical power, produced by the load during regeneration, to said membrane electrode assembly while closing said forward regulator to store excess hydrogen produced by said membrane electrode assembly in said hydrogen storage tank.

20. The invention of claim 15, further comprising:

a backpressure regulator between said membrane electrode assembly and said hydrogen storage tank;

a vent regulator for controlling the pressure of gases being vented by said anode; and

a connection for referencing the pressure of said backpressure regulator to said vent regulator to maintain the pressure at said cathode above the pressure at said anode.

21. The invention of claims 1 or 12 further comprising:

a cooling system within said membrane electrode assembly for recovering liquid from gases produced by said membrane electrode assembly.

22. The invention of claim 21, wherein the cooling system further comprises:

at least one cooling port positioned adjacent an upper end of said membrane electrode assembly to condense gaseous water fuel mixture in the gases produced thereby.

23. The invention of claim 21, wherein gaseous water/fuel mixture condensed adjacent said cathode is returned to said cathode.

24. The invention of claim 21, further comprising:

a hydrophilic transport mechanism for returning the condensed water/fuel mixture to said cathode.

25. The invention of claim 22, wherein gaseous water/fuel mixture condensed adjacent said anode is returned to said anode.

26. The invention of claim 25, wherein gaseous water/fuel mixture condensed adjacent said anode is returned to said anode by said water/fuel transport system.

27. The invention of clam 26, wherein said membrane electrode assembly and water/fuel transport system forming a first cell, the invention further comprising:

one or more additional cells positioned adjacent said first cell to form a stack;

current collectors position between each cell and at the beginning and end of the stack; and

additional cooling ports positioned in an upper end of one or more of said current collectors.

28. The invention of claims 1 or 9 wherein the membrane electrode assembly further comprises:

a spiral coil.

29. The invention of claim 28, further comprising:

a housing surrounding the spiral coil,

a hydrogen outlet at one end of the housing; and

a fuel water canister at the other end of the housing.

30. The invention of claim 29 wherein said housing is generally cylindrical.

31. The invention of claim 29 wherein said hydrogen outlet forms a first electrode.

32. The invention of claim 31 wherein said fuel canister forms a second electrode.

33. The invention of claim 29 wherein said fuel canister forms a second electrode.

34. The invention of claim 31 further comprising:

a hollow central core within the spiral coil for venting CO_2 formed within the spiral coil.

35. The invention of claim 34 further comprising:

a backpressure regulating valve system in said housing in communication with said hydrogen outlet and said hollow central core.

36. The invention of claim 35 further comprising:

a CO_2 supply line between the spiral coil and the fuel canister to pressurize the water fuel mixture.

37. The invention of claim 34 further comprising:

a CO_2 supply line between the spiral coil and the fuel canister to pressurize the water fuel mixture.

38. The invention of claim 29 wherein said housing further comprises:

a hydrogen storage volume in communication with the spiral coil.